Bus Lanes – Improving Travel Time or Reliability

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CAITR Perth, December 2008
Understanding the importance of travel time reliability as an important determinant of service quality for public transport

Appreciating the political issues associated with the allocation of road space in a congested road corridor

The importance of conveying complex analysis of a transit proposal to the community to achieve acceptance

Areas of further research to assist delivery of this message
A CASE STUDY

VICTORIA ROAD UPGRADE
• 2004 Ministerial Review into Bus Services in NSW.  
  *Creation of a network of strategic bus corridors, Victoria Road is Strategic Corridor 10 Parramatta/Sydney - one of Sydney’s busiest corridors.*

• NSW Government’s Metropolitan Strategy 2005.

• NSW Government’s Urban Transport Statement 2006.

• Victoria Road Peak Period - Bus Priority Feasibility Study.
  - Inbound/outbound bus lanes.
  - Tidal flow.
  - Additional traffic lanes at Iron Cove Bridge.

• Modelling of the benefits and impacts of the options – RTA appointed traffic consultants MWT in 2007 to start comparing options.
SYDNEY PRIORITY BUS CORRIDORS
Victoria Road is one of Sydney’s key radial arterial routes that are focused on Sydney CBD. In 2007 the average weekday daily traffic flow on Victoria Road across Iron Cove Bridge was 74,000 carried in five lanes.

More importantly,

- Around 200,000 bus passengers each week on Victoria Road
- Up to 170 buses, with more than 8000 passengers travel between Gladesville Bridge and The Crescent at Rozelle during typical weekday morning peak periods.
- This exceeds the total number persons convey by car during the same period.
EXISTING CONDITIONS - DARLING STREET
Project objective:

To improve efficiency and reliability of buses whilst maintaining peak direction flow for general traffic
IMPORTANCE OF TRAVEL TIME RELIABILITY

What time to leave??

Unreliable travel time = leave early

Average Travel Time = Bus Time Table

Must arrive to work on time

Home

Work
# GENERALISED COST OF PT TRAVEL

## PUBLIC TRANSPORT DEMAND MODEL PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Source / Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceptual parameter weightings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk Time Weight</td>
<td>2.0</td>
<td>Based on meta study of values from numerous studies (Transfund New Zealand 2000). Values shown are the average of values derived from secondary research.</td>
</tr>
<tr>
<td>Wait Time Weight</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>Unexpected Wait Time Weight Time</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>In vehicle Travel Time Weight</td>
<td>1.0</td>
<td></td>
</tr>
</tbody>
</table>

### Parameter Values

- **Walk Time**: 10 min  
  - 5 min access and egress to stops
- **Wait Time**: 0.5 Headway  
  - Based on service headway inputs
- **Unexpected Wait Time**: 0.68 SD  
  - 50th percentile of standard deviation of modelled running time (see ref)
- **In Vehicle Time (Base)**: 19.4 min  
  - Based on typical average travel behaviour in Melbourne.
- **Value of Time**: $8.69/Hour  
  - Based on standard values
- **Fare**: $0.84  
  - Based on bus boardings and estimated bus revenue in Melbourne for 2002

Vehicle Fleet = \[ \frac{\text{Round Trip Time}}{\text{Headway}} \] + \[ \frac{\text{Travel Time Variability}}{\text{Headway}} \]

Example
Round Trip Time = 60 mins
Headway = 5 mins
Bus Fleet of 12

Add 20 mins variability
Bus Fleet of 16
• 14 STA bus routes
• 112 service buses between 7am and 9am
• Bus stops:
  - 10 city bound;
  - 13 outbound
• Between 7am and 9am, 45% of all city bound people are on a bus.
• The T3 Lane is heavily abused by drivers – 58% illegal use
HOW LONG ARE BUSES TAKING?
2007 BUS TRAVEL TIME SURVEYS - AM PEAK PERIOD

AM city bound buses

16 minute variation in travel times
HOW LONG ARE BUSES TAKING?
2007 BUS TRAVEL TIME SURVEYS - PM PEAK PERIOD

PM outbound (i.e. westbound) buses
BUS TRAVEL TIMES CITYBOUND IN THE AM PEAK, 2007 AND 2008 SURVEYS

19 minute variation in bus travel times – very unreliable for passengers

- Surveyed Bus Travel Time September 2007
- Surveyed Bus Travel Time April 2008

* Surveys taken outside school holidays
WHEN DO PEOPLE CATCH BUSES IN THE MORNING?

- Bus Occupancy
- Surveyed Bus Travel Time September 2007
- Surveyed Bus Travel Time April 2008

* Surveys taken outside school holidays
Dwell times only increase by around 2 minutes in the busiest periods. Higher bus travel times are due to traffic congestion.
BUS USE TRENDS OVER TIME
CITYBOUND AM

Transport by other means

Bus usage

Source: annual RTA occupancy surveys
Source: annual RTA survey undertaken in March to provide snapshot
BUSES AND BUS PASSENGERS

• Bus usage is growing.
• Many buses can travel along corridor in less than 10 minutes.
• Buses in the busiest times can take 28 minutes or longer.
• How reliable is the morning trip? Passengers do not know whether to allow 10 or 28 minutes for the trip.
• A continuous bus lane should achieve consistent travel times of around 10 minutes.
• An outbound (i.e. westbound) AM/PM peak bus lane on Victoria Road would provide no noticeable benefit.
• However, a citybound PM bus lane WOULD provide noticeable benefits
PRIVATE VEHICLES (Cars)

• In this part of Victoria Road, the majority of AM city bound traffic is not through traffic but local traffic joining the corridor.
• Victoria Road in this area is an important local road for residents.
• The current level of traffic congestion is such that the existing T3 Transit lane has 58% violations in the morning peak.
• Clearly any proposal to reduce car lanes would strangle local traffic in this area – significant impact on residents.
• The evening peak is less concentrated, less congested flow on Victoria Road plus metering effect from city centre.
Treatments in Drummoyne, Rozelle and across the Iron Cove

- Convert the T3 lane to a bus lane with no new additional lane(s) over Iron Cove.

- Convert the T3 lane to bus lane with new additional lane(s) over Iron Cove.

- The above options with and without tidal flow arrangements.

- The above options with and without bus bays.
• AM bus lane city bound
• AM closure of Cary Street
• AM tidal flow system Drummoyne
• AM outbound bus lane across bridge

• Gordon Street right turn closed
  • Evans Street right turn closed
  • Median works would provide an additional lane
• PM city bound bus lane to Terry Street
• No outbound or westbound bus lane
• Cary Street is now open
• No tidal flow system in Drummoyne
• No tidal flow at Darling Street

• Gordon Street right turn closed
  • Evans Street right turn closed
  • Median works would provide an additional lane
• Paramics microscopic simulation.
• Periods simulated were the AM (6am to 10am) and PM (4pm to 7pm).
• Base modelling:
  ▪ calibration and validation with real traffic
  ▪ AM (7am to 9am) and PM (5pm to 7pm) periods.
• Fixed demand - No regional diversion effects from one traffic corridor to another.
• Scenario testing - Over 50 scenarios were modelled.
  ▪ Tidal flow
  ▪ Bus bays
  ▪ Bus lanes
PHYSICAL EXTENT OF THE TRAFFIC MODEL

The Paramics corridor model includes information on:

- Bus behaviour
- Lane usage
- SCATS traffic signal operations
- Pedestrian activity
- Traffic volumes
- Bus Services

The model includes 31 traffic zones.
SURVEY OF BUSES STOPPING
AM PEAK PERIOD CITYBOUND

Buses may not stop - either full or another bus on the same route is at that stop
SURVEY OF HOW MANY BUSES STOP AT THE SAME TIME, AT BUS STOPS

EXISTING AM PEAK PERIOD CITYBOUND
## Congested and Uncongested Traffic Conditions

### Minutes : Seconds

<table>
<thead>
<tr>
<th>AM Peak</th>
<th>City bound</th>
<th>Out bound or West bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing</td>
<td>General Traffic</td>
<td>Bus</td>
</tr>
<tr>
<td></td>
<td>12:35</td>
<td>14:43</td>
</tr>
<tr>
<td></td>
<td>24:47</td>
<td>39:38</td>
</tr>
<tr>
<td>Project</td>
<td>11:24</td>
<td>10:21</td>
</tr>
<tr>
<td></td>
<td>23:34</td>
<td>15:04</td>
</tr>
<tr>
<td>PM Peak</td>
<td>Existing</td>
<td>11:27</td>
</tr>
</tbody>
</table>

**Congested Conditions:** City bound average bus travel time saving is 24 minutes 34 seconds
MODEL RESULTS: UNCONGESTED BUS TRAVEL TIMES
FOR EXISTING CONDITIONS AND WITH PROJECT

Uncongested bus travel

Average 4 minutes 22 seconds saving
Max 6 minutes saving

Travel Time (mins)

Time Period
07:00 07:30 08:00 08:30

10.21 14.43

Project  Existing

[Bar chart showing travel times and savings for different time periods]
Congested bus travel times

MODEL RESULTS: CONGESTED TRAVEL TIMES - IN EXISTING CONDITIONS AND WITH PROJECT

Average 24 minutes 34 seconds saving

Max 38 minute saving

Travel Time (mins)

07:00 07:30 08:00 08:30

Time Period

Project Existing

15.04
39.38
BUSES

- Bus travel time of around 10 minutes and around 15 minutes on a very congested day (e.g. incident on Sydney Harbour Bridge, Anzac Bridge) could be achieved.
- If bus numbers increase under existing situation – conditions for bus travellers would continue to degrade.
- If bus numbers increased with the project in place – bus travel times would remain stable at around 10 to 15 minutes.
- Variability of bus travel times would reduce significantly.

TRAFFIC

- General traffic travel times remain broadly unchanged with the preferred project.
PARAMICS MOVIES
EXISTING AM CONGESTED CONDITIONS
Simply changing the T3 to a bus lane would make conditions even more congested for local drivers.

Not having a second crossing of Iron Cove Bridge, choices are to either:
- No bus lanes across the waterway – this would make the buses queue, or
- Have a bus lane across the water and create a large level of traffic congestion on the approaches to the bridge,

Proposed scheme will create additional capacity to maintain status quo for traffic and improve the lot of bus passengers.
• AM peak bus travel times should be consistently around 10 minutes although up to 15 minutes in heavy “congested” conditions – an improvement of up to 18 minutes
• The model results show average savings across the morning peak being from 4 minutes to 25 minutes depending on congestion levels.
• Improvement for PM city bound bus journey times by up to 8 minutes.
• An improvement in the reliability of buses, particularly in the AM peak.
• Maintains existing general traffic flows (more than 50% of which is locally generated).
• The potential exists to increase city bound bus services by at least 50% - bus travel times of around 10 minutes could be maintained.
Iemma drops the ball again

A CONTROVERSIAL plan to build a second bridge across Iron Cove looks set to join the Iemma Government's long list of troubled transport initiatives as construction costs blow out by $100 million - all for a 50-second saving on the time motorists wait in traffic.
Modelling kept under wraps

THE NSW Roads Minister, Eric Roozendaal, last night refused to release traffic modelling that he says has superseded a 2006 report that shows duplicating the Iron Cove Bridge would attract traffic to Victoria Road. ......

"There's a simpler and better way," said the Opposition's roads spokesman, Duncan Gay. "That is to address the pinch points at Darling Street and Lyons Road and to examine converting the existing kerbside T3 lane between Iron Cove Bridge and Darling Street to a bus lane."
$162m upgrade a waste: review

THE $162 million upgrade of Victoria Road will expose pedestrians to danger, encourage traffic to use the already clogged artery and has so little economic benefit it "would not normally be considered sufficient to justify construction", says an independent review of the project.
$156m to cut four minutes of travel

Rhys Haynes

TRAVEL times for cars will increase and bus services will be just four minutes faster despite a $156 million upgrade to Victoria Rd.

The two year, 3.5km upgrade has been called a farce.

Travel times for motorists are expected to increase during some morning and evening peaks, despite construction of an Iron Cove Bridge duplicate.

A traffic consultant paper released last week by the RTA said some bus times could be reduced by 25 minutes, but in the three-hour AM peak period, the average bus travel time savings would be four minutes and 22 seconds.

After 24 months of construction, this represents average speeds of just 5.8km/h for buses. The report, by Mason Wilson Twiney, also revealed:

- MORNING westbound average car and bus travel times will increase by 45 seconds;
- EVENING westbound bus travel times will increase by 22 seconds; and
- EVENING westbound car travel will decrease by six seconds.

The paper revealed the morning peak travel times were likely to be worse as more traffic used the road because of the upgrade.

"[These times] are unlikely to be achieved in reality as traffic is likely to divert from further afield to take advantage of travel time savings," the report concluded.

It concluded with the stunning revelation that all estimates did not take into account any congestion on connecting roads: "On occasions, Anzac Bridge citybound traffic is impeded by queued traffic from Sydney Harbour Bridge northbound and this can have a detrimental effect on the Victoria Rd travel times."

Roads Minister Michael Daley said the Victoria Rd upgrade was designed to reduce travel times for the 200,000 bus commuters who used Victoria Rd each week.
Travel time reliability is a misunderstood and underappreciated benefit when community evaluates the benefits of PT improvement proposals.

Road space is a precious commodity in a congested corridor and relocation of that space has significant political implications.

Further research is required into understanding the community costs associated with poor PT travel time reliability in terms of:

- Impact on people's choice to use PT
- Capital and running costs of PT